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PLAN OF POTATO PSYLLID SURVEY

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Purpose -- The purpose of this statement is to outline a uniform plan as a guide for an annual potato psyllid survey to be conducted cooperatively by the Plant Pest Control Branch, Economic Insect Survey Section, and the state survey workers in the states concerned. As needed, the Entomology Research Branch will assist in this program during 1956 and 1957. It is necessary that the survey be conducted, by all who participate, on the same uniform plan so that the data may be combined and evaluated and a complete understanding of the potato psyllid situation for the entire area obtained. The results of the survey may then be made available, through the insect reporting systems of the various states and the Plant Pest Control Branch, for the benefit of growers and others concerned. It is necessary that growers, extension personnel, and insecticide distributors and dealers receive information of potential psyllid outbreaks early in the growing season. The presence of psyllids is not recognized in the fields and by the time psyllid yellows symptoms appear it is too late to apply measures for effective control. The details of this plan are based on research conducted by the Entomology Research Branch from 1945 to 1955. Refer to USDA Technical Bulletin No. 1107, February, 1955.

Areas involved -- It has been determined that the area where the potato psyllid causes the greatest damage comprises most of Colorado, Utah, Wyoming, southeastern Montana and western Nebraska. (See map p.4 above reference). In epidemic years damage may extend somewhat beyond this area and under favorable conditions in some years damage will occur in restricted areas where potatoes are grown early in the spring in California, Arizona, New Mexico and Texas.

It has been determined that psyllids do not overwinter in the northern states where they cause the most damage but overwinter in an area in southern Texas centering in the vicinity of Del Rio and in another area in southern California and southern Arizona. At the end of March psyllids are moving out of the overwintering areas and into west Texas, southern New Mexico, southern Arizona and southern California. It is the size of the population

occurring in late March in the spring breeding area that is available to move north during May and June that determines the potential infestation in the summer breeding areas in the northern states.

Two surveys should be conducted each year. One should be made in late March in the spring breeding area to determine the numbers of psyllids available to move northward. The second should be a series of five surveys conducted during May and June at biweekly intervals in the northern states (summer breeding area) to determine the progress of the northward movement. The peak of population in the summer breeding area will determine the need for control measures in the area for the remainder of the growing season. The host plants to be used in both the spring and summer breeding areas are various species of wild and cultivated Lycium. In the spring breeding area wild Lycium is the most important overwintering and spring breeding host. Very few psyllids have been found on any other host plant in this area. In the summer breeding area the cultivated Lycium halimifolium (Matrimony vine) is sampled instead of other host plants because it is more nearly like the host sampled in the spring breeding area, its foliage appears ahead of that of other host plants in the spring and before psyllids begin migrating. It also remains in foliage throughout the crop growing season.

Survey of spring breeding area -- The survey locations of the spring breeding areas east of the Rocky Mountain range that should be examined are: 1. * Big Spring, Texas -- This is a rather small area and most of the Lycium is found in the valley just east of the city.

2. San Angelo, Texas -- Lycium occurs abundantly in this vicinity and has been sampled along the main highways north, east, south and west.

3. Del Rio, Texas -- Lycium is abundant in this area, particularly along U. S. Highway 90 east to Brackettville. Lesser amounts are found west and south.

4. Marathon, Texas -- Lycium is found in the valleys and along dry washes between Sanderson and Marathon.

5. El Paso, Texas -- Las Cruces, New Mexico -- Lycium is more abundant in this location than any of the others. It extends along the river valley from about 50 miles south of El Paso to about 50 miles north of Las Cruces. It occurs along the highways and country roads and thrives best near irrigation ditches and bar-pits.

* The numbers refer to numbered areas on the attached map.

While Lycium may be found at many other places in the spring breeding area east of the mountains, those listed are considered representative of the entire area. Sixty 10-sweep samples are taken at location 1, 75 each at locations 2 to 4, and 90 at location 5. An average of the psyllid populations determined at all these locations will indicate the potential population to move northward east of the mountain range.

There are two general areas west of the mountain range which apparently are the source of psyllids that move northward into western Colorado and Utah. These areas are:

6. South-central Arizona -- This point is in the vicinity of Phoenix extending east along U. S. Highway 60-70 to Superior, northwest along the same highway almost to Wickenburg, southwest to Gila Bend, and south to Tucson.

7. Southern California -- This area has been surveyed only twice and, therefore, is not definitely outlined. Lycium occurs abundantly along the Colorado River from Yuma, Arizona to several miles north of Needles and west to Barstow, California. It appears to be strictly a desert plant and none could be found along the coastal area.

These areas are large and 90 10-sweep samples should be taken in each area.

Survey of Summer Breeding Area -- Matrimony-vine, cultivated Lycium halimifolium is the host plant used in the survey points in the summer breeding areas. It is an ornamental plant grown around the older farm and city dwellings. Ten observation points are established at random in each of the following areas and sampled at biweekly intervals beginning about May 15 and ending the last week in June.

8. North Platte Valley -- This area extends from Lingle, Wyoming to Minatare, Nebraska.

9. Northern Colorado -- In the vicinity of Fort Collins, Greeley and Gilcrest, Colorado.

10. Arkansas Valley -- Along the Arkansas River Valley from La Junta to Pueblo, Colorado.

11. Western Colorado -- In the vicinity of Grand Junction, Colorado and surrounding towns in the Grand Valley.

12. Northern Utah -- From Provo to Logan, Utah.

The last three areas are the most important because they are closest to the spring breeding areas and, in most years, show the earliest movement of psyllids. In fact, after some experience, the determination of the time and intensity of the peak of movement into these areas is all that may be necessary in the summer breeding area. It will not be necessary to make observations in any of the high-altitude areas since psyllids move into these areas after the peak of population occurs in the lower altitudes.

Methods -- In the spring breeding areas, on wild Lycium, samples should be taken in units of 10 sweeps. These plants are brush-like and are too rough to take larger samples without mangling the psyllids beyond recognition. Samples should be randomized as much as possible over the area being surveyed. As near as possible the same points should be used from year to year in order that comparisons in populations can be made from one year to another. The amount of Lycium varies very little over a period of years but the condition of these host plants varies greatly with the season. Host plant conditions are very important in determining psyllid abundance and should be noted. The terms excellent, very good, good, fair, poor and dormant are used to designate host plant conditions. These terms are used to refer to the conditions of the host plant as to being favorable or unfavorable for psyllid breeding. Plants with a heavy, dense growth of foliage and new plants growing close to the ground are more favorable for psyllids. Open growth and sparse foliage are unfavorable. Lycium being a desert plant will become defoliated during periods of drought or cold weather, but quickly puts out foliage again when these conditions are relieved.

In the summer breeding area samples are taken in 50-sweep unit. The cultivated species of Lycium is not as rough as the wild species and therefore the insects are not injured in sweeping. These plants are nearly always in excellent condition during May and June. In all cases psyllid populations are recorded in numbers per 100 sweeps. Population counts are made only of the adult stage.

Significance of population data -- The intensity of the peak of adult population that moves into the summer breeding area will determine the threat to crops in that area for the remainder of the growing season. In most years this peak occurs the first week in June in southern Colorado and near the first of July in

northern Colorado and the North Platte Valley. Making the results of the survey available then allows sufficient time for control measures to be applied to potato or tomato crops if needed.

The following are psyllid populations recorded in the spring breeding area east of the mountains during the past 10 years, and the general condition of the host plants, in comparison with an average of the peak of psyllid population in the summer breeding area:

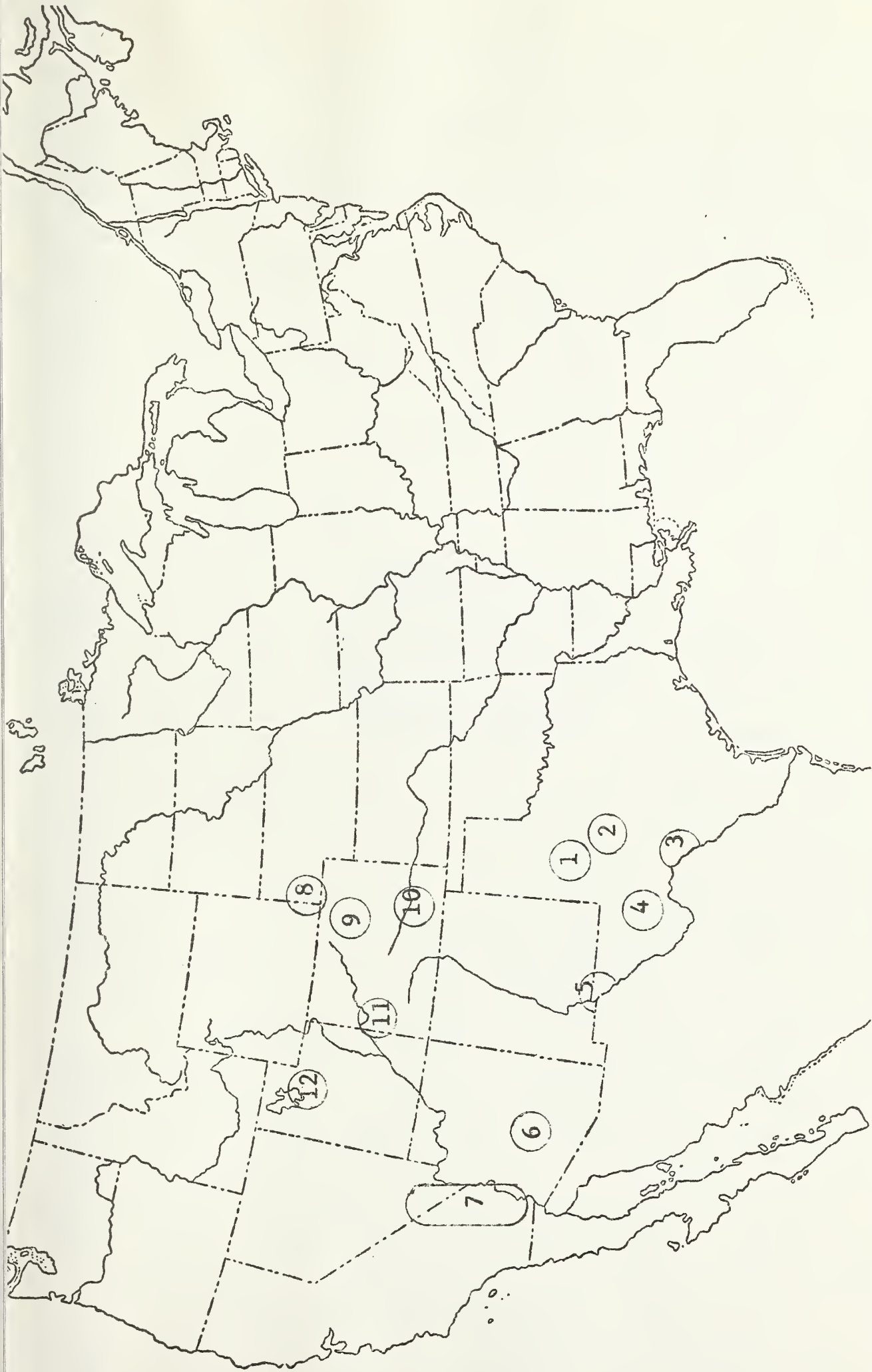
Year	Spring Breeding Area		Summer Breeding Area	
	No. per 100 sweeps	Condition of host plants	No. per 100 sweeps	Condition of host plants
1946	14	fair	7	Excellent
1947	52	good	17	Do
1948	11	very good	28	Do
1949	18	excellent	157	Do
1950	19	excellent	112	Do
1951	1	very good	2	Do
1952	2	very good	2	Do
1953	29	very good	54	Do
1954	69	fair-poor	28	Do
1955	22	very good	41	Do

From these data it will be noted that in the two years (1951 and 1952) when very low populations occurred in the spring breeding area populations were so low in the summer breeding area that no control was needed, even on the early crop of potatoes which in every other year needed control applications. In some years, such

as 1947 and 1954, high spring populations (altered to some extent by the conditions of host plants) did not result in high summer populations, which shows that conditions were not favorable for their northward movement. This means that in years when very low populations occur in the spring breeding area no infestations are likely to develop in the summer area but in years of high spring populations the summer areas should be watched very closely.

The summer populations in 1949 and 1950 were of epidemic proportion and it is very doubtful if any potatoes or tomatoes could have been grown anywhere in the summer breeding area without control measures. In 1951 and 1952 probably no control would be needed anywhere, even on the early crop of potatoes which is more severely attacked than late crops of potatoes and tomatoes. In the other years control measures were needed on all crops but growers were able to get by with three applications instead of five, such as are needed in epidemic years.

Some Factors Affecting Psyllid Populations -- Experience has shown that psyllid populations develop most rapidly when temperatures average from about 60 to 70° F., other conditions being favorable. At temperatures above this range they move northward from the spring breeding area and in the summer breeding area they move toward the mountains where temperatures are lower. They seem to survive somewhat better at temperatures below 60° F. than above 70 but they move away from the mountains into the plains when temperatures remain very long below the optimum (60-70° F.). There is some evidence to indicate that they attempt a southward movement in the fall from the summer breeding area but apparently very few reach the spring breeding (overwintering) area. It is believed that the spring breeding area is repopulated from psyllids that survive the summer in the higher elevations in New Mexico. The psyllid is a dry climate insect and does not move eastward into the humid areas of the United States. It has been observed that populations do not develop much (in fact may drop off) in the summer breeding area during long periods of rainy weather.



Location of spring and summer potato psyllid survey areas. (Numbers refer to numbered areas in the text).

